AIR QUALITY IN THE
McIVOR AVENUE AREA OF WINNIPEG
DURING JULY, 1982

Air Standards and Studies Section
Environmental Management Division

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ABSTRACT

In response to requests from a group of concerned citizens, a preliminary study of air quality was undertaken in the McIvor Avenue area (gravelled portion) of the City of Winnipeg. Air samples were collected for ten days in July, 1982, using the standard high volume air sampler. Testing results indicated that particulate levels exceeded the Manitoba Air Quality Objectives quite frequently even though the magnitude of these exceedences were not uncommon to the Winnipeg area.

INTRODUCTION

In early July, 1982, in response to numerous requests from a group of concerned citizens residing on McIvor Avenue in the northeast area of the City of Winnipeg, a preliminary study was undertaken to determine the quality of air in this area with respect to dust particulate levels and its constituents.

McIvor Avenue extends between Henderson Highway and Lagimodiere Boulevard. This study concerned itself with that portion of McIvor Avenue which is unpaved and extends between DeVries and Gateway Avenue. The traffic density on this residential street is estimated at the area of study to be about 1,000 vehicles per 24 hours.

Concerns from citizens living within the area were related to elevated levels of dust arising from vehicular movements and entrainment of street dust. The street over the last several years has been covered on occasion with calcium lignosulfonate and other dust suppressant materials.

The purpose of this study was to determine dust levels in the area of voiced concerns and to compare these levels to provincial air quality objectives and to other areas of the City of Winnipeg. Some analysis of the dust constituents was also undertaken for comparison to air quality guidelines (if possible) and for comparison to levels within other areas of the city.

MANITOBA AIR QUALITY OBJECTIVES AND GUIDELINES

The Province of Manitoba together with the other Provinces has worked co-operatively with Environment Canada to establish National Ambient Air Quality Objectives. As these objectives are established, Manitoba has adopted these as Manitoba Air Quality Objectives. For those pollutants not addressed in the above collective manner, Manitoba has undertaken the task of determining suitable pollutant levels and has established Manitoba Air Quality Guidelines. A copy of the pollutants for which objectives and guidelines have been determined is shown in Appendix 1.

The establishment of objectives and guidelines are based upon the following assessment level:

1. Maximum Tolerable Levels

   This level denotes time-based concentrations of air contaminants beyond which, due to a diminishing margin of safety, appropriate action is required to protect the health of the general population.

2. Maximum Acceptable Levels

   This level is deemed essential to provide adequate protection for soils, water, vegetation, materials, animals, visibility, personal comfort and well being. These maximum acceptable levels represent a realistic limit beyond which control action can be taken.

3. Maximum Desirable Levels

   This level defines the long-term goal for air quality and could provide the basis for an anti-degradation policy for the unpolluted portions of the Province and for the development and application of control technology. At this level, there would be no detectable adverse biological effect on any receptor.

SAMPLING

To ensure representative sampling, two stations (Figure 1) were selected at either end of the unpaved section of McIver Avenue. This portion is slightly less than one mile in length with the center portion about five feet lower than either end. The southern-most station, designated Station 1 (See Figure 2) was at the Rudolph residence (1036 McIvor Ave), the northern station, #2 (See Figure 3), at the McCallum residence (830 McIvor Ave). Both sets of samplers were placed at ground level on the front lawns, fifty feet back from the road with collector ports four feet above ground. The collectors, which were standard high volume samplers, were set up in duplicate to allow for calendar day-to-day sampling. Sampling was conducted from mid-night to mid-night for a 24 hour period, by using external timing devices. This arrangement of samplers allowed for the collection of one sample per working day.

The high volume air sampler operates by drawing air into a covered housing and through a glass fiber filter using a high-flowrate blower at a flowrate of about 1.13 to 1.70 cubic metres per minute for a 24 hour period. This allows suspended particulate within the size range of 0.1 to 100 micron aerodynamic diameter size range to collect on the filter.

The high volume samplers were calibrated with an orifice kit prior to the start of the survey. Rigid operational standards were adhered to in order to ensure collection of valid data.

After sample collection, the filter papers were submitted to the Provincial Technical Services Laboratory for gravimetric particulate loading determination (TSP) and particulate constituent analysis for the heavy metals, lead, cadmium, arsenic, chromium, and for sulphates, nitrates, sodium and calcium.

Concurrent with the above sampling, samples for particulate were also collected at two established National Air Pollution Surveillance (NAPS) sites; one at downtown Winnipeg (65 Ellen Street - NAPS 9119) and one within a residential area of Winnipeg (299 Scotia Street - NAPS 9118). Samples from these sites were analysed for particulate loading, lead, sulphates and nitrates.

RESULTS

The tabulation of total suspended particulate and particulate constituent levels as measured at the two McIvor sites and background NAPS stations for the days of sampling are shown in Table 1. These data values are integrated 24-hour averages expressed in micrograms of particulate (or particulate constituent) per cubic metre of air corrected to reference conditions of 25°C and 101.3 kilopascals of pressure. Missing data values are a result of malfunctioning equipment, or because analysis was not requested.

Meteorological data listed (and that used for air volume correction) were obtained from the Winnipeg Weather Office from measurements taken at the Winnipeg International Airport. The prevailing winds noted are indicative of winds over the 24-hour period and do not show the range of variability. Table 2 shows average 24-hour wind speed and directions in relation to the two stations during operational days.

Graphical plots for comparison purposes of the above data levels are shown respectively in Figures 4, 5, 6, 7, 8 and 9 for the air parameters total suspended particulates, lead, sulphates, nitrates, sodium and calcium. Where applicable objective setting levels are available, these are shown on the appropriate figures.

DISCUSSION OF RESULTS

The scope of this project addressed the particulate or dust component of air quality for ten days in July, 1982; the first two days of sampling were on a weekend while the remaining sampling days were during weekdays. As shown in Table 2 during the sampling period of time, varied road conditions and varied wind meterological conditions were present. This variety of conditions tends to support the inference that the information collected is generally representative of conditions in the area.

PARTICULATE LEVELS

Total Suspended Particulate (TSP), or the term dust as it is used in the context of this report, is a general term which applies to a wide variety of solid or liquid particules of a size and configuration such that these particles tend to remain suspended in the air and can thus be drawn into the respiratory passage.

By the sampling technique used, only particles the size of 100 microns or less aerodynamic diameter could be collected. In general, it is thought that only those particles below 2.5 microns can penetrate to the deeper regions of the lungs. This matter is currently under considerable review by the United States EPA who may promulgate an air quality standard for particulate which will be size selective. However, the method of sampling used in this study collected a wide size range of particulate of which a part could be respirable.

Since the constituents of particulate can greatly vary, it is not only the absolute quantity of particulate that is of interest but also the composition. This survey did analyze for the common components of particulate to determine their relative levels.

Particulate material is one of the more commonly visible forms of pollution because its presence can be observed by an interference with visibility, a soiling effect on materials or as a respiratory irritant.

The Manitoba Air Quality Objective for particulate, to which data from this study can be directly compared, is the 24-hour integrated average for the Maximum Acceptable Level (MAL) and Maximum Tolerable Level (MTL). The level of 120 micrograms per cubic metre for the 24-hour MAL is based on interference with visibility and on nuisance effects

which occur at lower particulate concentration. The 400 microgram per cubic metre level for the 24-hour MTL is not fully substantiated at this time but is intended to relate more directly to possible health effects for those suffering from respiratory problems.

A review of the total suspended particulate data, gathered over the period of the study, shows that at the background NAPS site (9119) was above the 24-hour MAL level (138 micrograms/m^3 on July 22, 1982). All measured levels at the residential site (NAPS 9118) were below the 24-hour MAL guideline level.

Total suspended particulate levels at the McIvor sites were variable on a day-to-day basis and generally were higher in magnitude than those levels measured at the NAPS background sites (except for July 13 and 19).

The area covered in this sampling survey (McIvor Ave) is a gravelled road with access to a main highway. Because the road is slightly lower toward the centre, dust seems to stay suspended within the central portion during periods of calm to light winds. Sampling points were established at either end because of site availability and generally representative readings even though contaminant levels might be occasionally higher at the centre of the block.

A factor which caused considerable variation during the sampling period was the state of the road. Conditions ranged from "very dry" on July 10th and 11th to "damp" from the 12th to the 16th to "dry" again from the 19th to 22nd. The dampness was caused by light showers and periodic watering by the City watering trucks. Calcium chloride was apparently spread on the road by City trucks in an effort to control dust levels.

A comparison of particulate levels between the two McIvor sites were similar with levels at site 1 somewhat higher on average and considerably higher on July 15 than those measured at site 2. Site 1 is closer to the center of the block and further from paved or maintained-gravel thoroughfares. Also through traffic is travelling at a greater speed by the time it reachs this site, possibly accounting for slightly higher particulate values.

Particulate levels at the McIvor sites for July 10 and 11 (Saturday and Sunday) were 222 and 395 micrograms per cubic metre (ug/m^3), respectively. Road conditions during these days were dry and winds were of a direction such that road dust influence could occur on the sampling sites.

On July 13, 1982, particulate levels ($\simeq 60$ ug/m^3) at the McIvor sites were significantly below the 24-MAL. Road conditions were visually determined to be damp (in the morning) even though winds were from the NNE.

For the sampling days July 14, 15 and 16 road conditions were visually determined to be damp (either from rainfall or from the application of dust suppressant). Particulate levels measured during those days varied from below the 24-hour MAL (e.g. 36 ug/m^3 at site 2 on July 15 and 102 ug/m^3 at site 2 on July 16) to well above this criteria level (211 ug/m^3 at site 1 on July 14).

Particulate levels on July 19 were in the 24-41 ug/m^3 range even though the road was dry. However, fairly strong winds were present from the south and could have carried dust (if present) away from the samplers.

The aforementioned particulate levels for the first seven days of the sampling period at the McIvor sites, even though generally higher than the levels measured for the same days at the background sites, are not unusual to the Winnipeg or the Prairie region. Because of the neighboring agricultural areas and the presence of relativ ly strong flushing winds, particulate levels in the range of 200-400 ug/m^3 were recorded at NAPS 9119 for about ten percent of the time in both 1980 and 1981. [3]

Particulate levels at the McIvor sites for July 20, 21 and 22 were above the Maximum Tolerable Levels and ranged from 402 ug/m^3 at site 1 for July 20 to 807 ug/m^3 at site 1 for July 21. Road conditions during these days were dry and the wind direction was such that road dust could impinge upon the samplers. These levels are above the normally observed levels within the Winnipeg area. Levels of the above magnitude were recorded at NAPS sites during the spring of 1981 [3] and were observed regularly during monitoring in industrial parts of the City of Winnipeg. [4] As a further comparison, elevated dust levels were measured in most of southern Manitoba during the deposition of volcanic ash from Mount St. Helens in May of 1980. Typical dust levels measured during those days were in the 650 to 1100 ug/m^3 range. [5]

Urban air quality has been measured at major Canadian urban centres since the mid-seventies. According to data gather. l through the operation of the NAPS program in Canada, it has been determined that about ten percent of the maximum 24-hour particulate levels across the country have exceeded the MTL through the years 1974-79. [6]

For the ten days of sampling and the collection of nineteen particulate samples at the McIvor sites, the distribution of levels in

comparison to the Manitoba Ambient Air Quality Objectives were:

No. of particulate levels lower than the MAL (i.e. $\leq$ 120 ug/m^3)	6
No. of particulate levels higher than the MAL but less than the MTL (i.e. 121-400 ug/m^3)	7
No. of pArticulate levels higher than the MTL (i.e. $>$ 400 ug/m^3)	6
Total	19

HEAVY METAL LEVELS

The particulate samples were analyzed for certain heavy metals, lead cadmium, chromium and arsenic. Heavy metals are of interest because their deposition may affect a variety of receptors, including human health. Heavy metals may be respirable (if a component of the fine or small sized particulate), resulting in the elements being absorbed in certain body organs and systems thus adversely affecting bodily functions.

As an example, exposure to elevated lead levels may result in absorption into the blood stream (especially in young children) and impairment of heme synthesis in cells. Another adverse effect associated with elevated blood lead levels is the possibility that nervous system damage may occur.

Of the above heavy metals, Manitoba has an ambient air quality objective only for lead. The 24-hour MAL of 5.0 ug/m^3 is intended to protect the health of young children, the most sensitive receptor of concern. In an urban environment the primary source of lead is generally due to the burning of leaded gasoline in automobiles.

The lead-in-air concentration levels at both the NAPS background sites and the McIvor sites were well below the MAL for lead and are thus acceptable. Except for July 14 at site 1 where a level of 2.13 ug Pb/m^3 was measured, levels between the background and McIvor were very similar and are not of concern.

The measured levels of cadmium, chromium and arsenic at the McIvor sites were at the lower detection range of the sampling/analytical method and were generally less than 0.001 ug/m^3. Even though no guidelines are available to directly compare the measured levels, these levels are lower than those measured in downtown Winnipeg (NAPS 9119) during a special sampling survey of 1979 and 1980 [7] or those elevated measured in other urban centres.

SULPHATE/NITRATE LEVELS

Sulphates and nitrates as a constituent of particulate are of interest primarily because these exist as very fine particles and therefore can enter the respiratory system. These two constituents also have been associated as a major contributing factor to visability reduction especially within the northeastern part of North America.

At present, no ambient air quality guidelines have been determined for these two parameters. However, levels of these two parameters have been measured regularly as a part of the NAPS program operation.

Sulphate levels at the McIvor sites as measured by this study were in the range of 1.5 to 4.3 ug/m^3. These levels appear to be considerably below those measured at NAPS sites. [3]

Nitrate levels at the McIvor sites were in the range of 0.05 to 0.20 $\mu g/m^3$; these levels appear to be considerably below those measured at NAPS sites. [3]

Since the sulphate and nitrate levels measured within the McIvor area are lower than those measured at the NAPS sites, it is considered that these levels are not unusual.

SODIUM CALCIUM LEVELS

The sodium and calcium content of the collected particulate was measured to reflect that portion of the total particulate that originated from soil-related sources (i.e. agricultural soil; general dust). The measured levels of these parameters varied considerably from day-to-day. In general, higher particulate levels appear to correlate with higher calcium levels in the particulate. For example, particulate levels of 24-41 $\mu g/m^3$ on July 19 had a calcium content equivalent of 2.44-4.00 $\mu g/m^3$ whereas for a day such as July 21 when particulate levels were in the 670-800 $\mu g/m^3$ range, calcium levels were in the 88-95 $\mu g/m^3$ range. This information supports the position that a portion of the collected particulate is a direct result of road dust material.

CALCIUM LIGNOSULFONATE

Some concerns were expressed about the possible effect on respiratory health because of the use of calcium lignosulfonate as a dust suppressant.

According to the Condensed Chemical Dictionary, Eighth Edition Van Nostrand Reinhold, calcium lignosulfonate is described as a "metallic sulfonate salt made from the lignia of sulfite pulp-mill liquors.... no pronounced odour....stable in dry form and relatively stable in aqueous solution....forms colloidal solution...binder....". No apparent toxic hazards are listed. In light of these properties, no specific analysis for this compound was felt to be necessary. Its presence was measured as part of the total suspended particulate.

CONCLUSIONS

Based on the ten days of air quality sampling within the gravelled portion of McIvor Avenue, air quality can be summarized as:

1. Particulate (dust) levels in the McIvor area exceeded the Manitoba Ambient Air Quality Objectives (24-hour Maximum Acceptable Level and Maximum Tolerable Level) about two-thirds of the time. Even though the magnitude of the particulate levels are not uncommon to the Winnipeg area, they appear to be higher than the background NAPS Winnipeg levels.
2. The heavy metal constituents of the particulate were similar to background levels and were not considered to be of concern.
3. The other constituents of the particulate (i.e. sulphates, nitrates, sodium and calcium) did not appear to be different from background levels.

REFERENCES:

1. Private Communication; City of Winnipeg, Works and Operations, District #4.

2. Criteria for National Air Quality Objective, Federal-Provincial Committee on Air Pollution, Fisheries and Environment Canada, November 1976.

3. Manitoba Ambient Air Quality - Data Summaries - 1970-1981, Manitoba Environmental Management Division, March 1982.

4. Ambient Air Lead-in-Particulate Survey Around Winnipeg's Secondary Lead Smelters; Manitoba Environmental Management Division; February, 1980.

5. Ambient Air Quality During and After Mount St. Helens Volcano Ash Deposition of May, 1980; Manitoba Environmental Management Division; October, 1980.

6. Urban Air Quality Trends in Canada, 1970-79 Environment Canada, EPS 5-AP-81-14; November 1981.

7. Compilation of Ambient Airborne Heavy Metal in Suspended Particulate Data for the Years 1976, 1977, 1979, 1980, from the Provincial Network; Manitoba Environmental Management Division, February 1982.

TABLE 1 - PARTICULATE AND PARTICULATE CONSTITUENT LEVELS

Concentrations in Units of Micrograms per Cubic Metre as a 24-Hour Sample

Date	Wind	Site	Total Suspended Particulate (TSP)	Sulphate (SO_4)	Nitrate (NO_3)	Sodium (Na)	Calcium (Ca)	Lead (Pb)	Cadmium (Cd)	Chromium (Cr)	Arsenic (As)
82-07-10	SE 1	1	222	1.38	.22	< .01	21.85	.20	< .001	< .001	< .001
		2	222	1.84	.16	< .01	24.04	.15	.003	< .001	< .001
		9118	33	4.94	1.36	-	-	.21			
		9119	59	1.88	.95	-	-	.13			
82-07-11	W 10	1	-	-	-	-	-	-	-	-	-
		2	395	.96	.16	.93	48.61	.22	.003	.02	< .001
		9118	-			-	-	-			
		9119	-			-	-	-			
82-07-13	NNE 14	1	57	.76	.08	< .01	1.99	.03	< .001	< .001	.001
		2	69	.68	.07	< .01	44.40	.05	< .001	< .001	.002
		9118	16			-	-	.10			
		9119	33			-	-	.24			
82-07-14	SE 8	1	211	3.18	.11	2.86	23.84	2.13	< .001	< .001	< .001
		2	184	3.12	.11	8.42	22.14	.16	< .001	< .001	< .001
		9118	32			-	-	.20			
		9119	93			-	-	.38			
82-07-15	S 17	1	130	4.28	.20	1.03	9.25	.24	< .001	< .001	< .001
		2	36	4.31	.16	5.23	5.23	.06	< .001	< .001	< .001
		9118	30			-	-	.14			
		9119	94			-	-	.40			
82-07-16	S 17	1	124	3.30	.18	3.82	16.32	.10	< .001	< .001	.002
		2	102	3.00	.17	2.21	10.44	.10	< .001	< .001	.002
		9118	33	10.51	1.06	-	-	.11			
		9119	94	2.99	1.40	-	-	.14			
82-07-19	S 24	1	41	1.39	.12	< .01	2.44	.07	< .001	< .001	< .001
		2	24	.99	.11	.39	4.00	.06	< .001	< .001	.001
		9118	22			-	-	.13			
		9119	113			-	-	.35			
82-07-20	N 15	1	402	1.79	.17	5.35	50.33	.11	< .001	< .001	< .001
		2	444	1.76	.17	< .01	46.93	.13	< .001	< .001	.001
		9118	28			-	-	.17			
		9119	58			-	-	.23			
82-07-21	N 13	1	807	1.36	.07	< .01	95.16	.21	.003	.002	.002
		2	673	1.16	.06	.31	88.89	.21	< .001	.002	.001
		9118	23			-	-	.13			
		9119	53			-	-	.20			
82-07-22	ESE 13	1	600	1.84	.10	10.58	98.61	.21	< .001	.002	.001
		2	454	2.30	.10	3.98	55.47	.18	.003	.002	.002
		9118	36	2.65	.56	-	-	.13			
		9119	138	2.43	.68	-	-	.30			

DATE	WIND DIRECTION	WIND SPEED (Knots)	Road Cond
JULY 22nd		13	Dry
21st		13	Dry
20th		15	Dry
19th		24	Dry
16th		17	Damp
15th		17	Damp A.M.
14th		8	Damp CaCl
13th		14	Damp AM
11th		10	Dry
10th		1	Dry

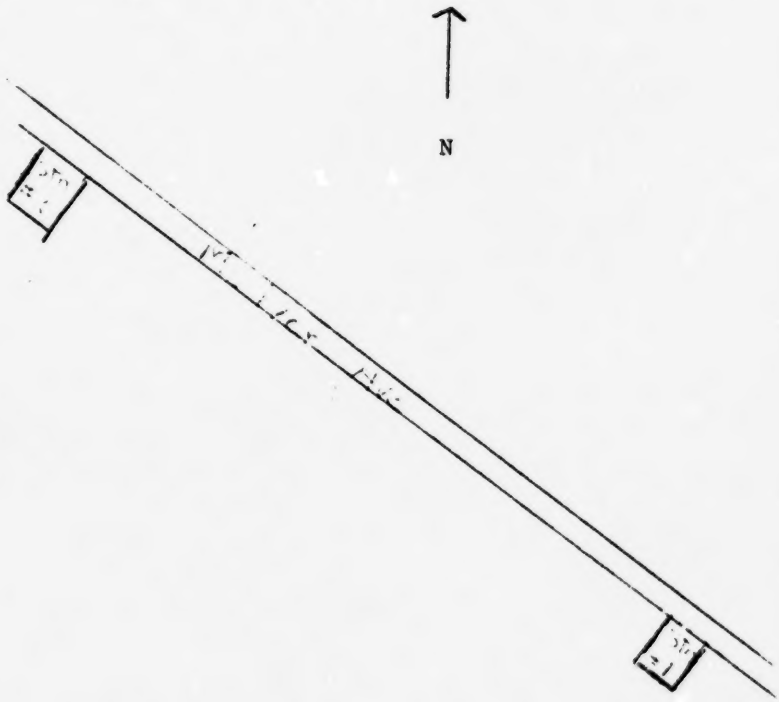


TABLE 2 - Wind Speeds and Directions Relative to McIvor Ave Stns.

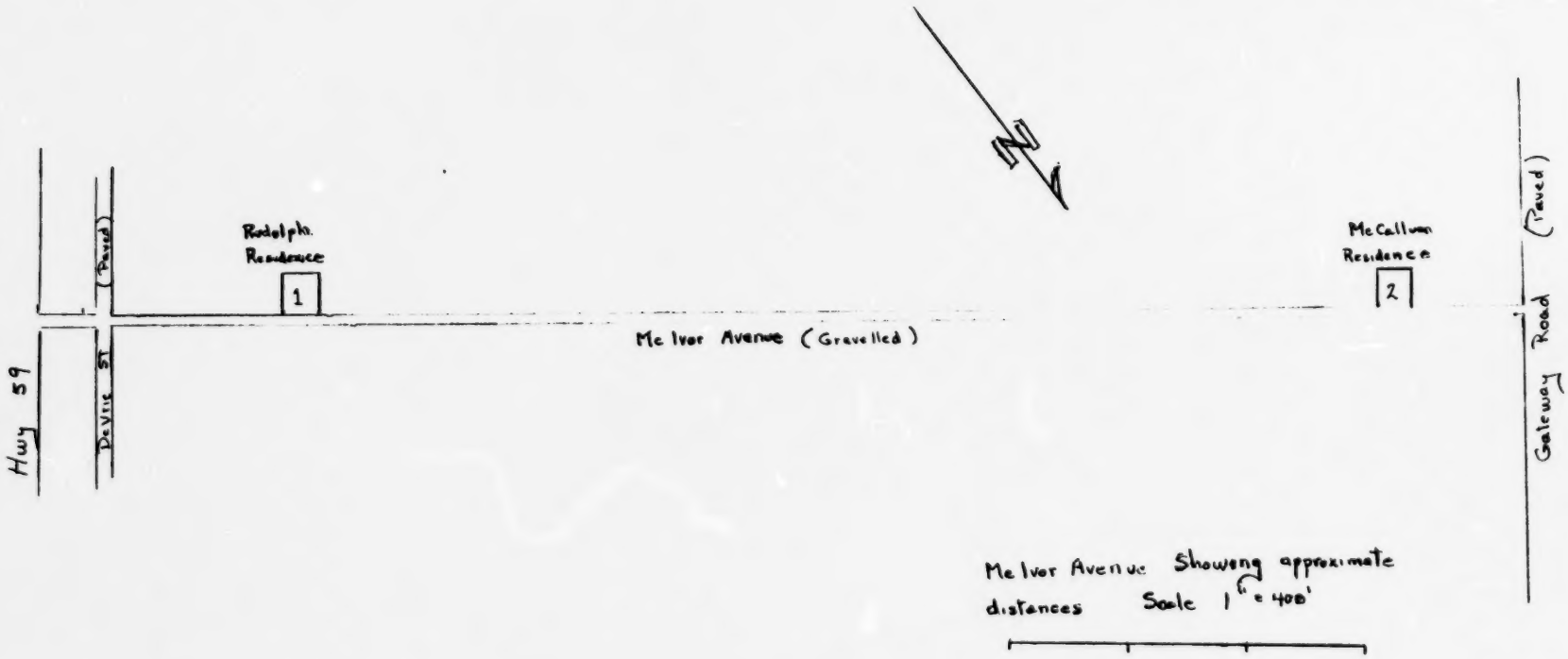


FIGURE 1 - MAP OF MCIVOR AVENUE

FIGURE 2
Mc Ivor Avenue (Gravelled)

Rudolph Residence
Scale 1" = 20'
MC1 1A and 1B
1036 Mc Ivor Ave
E. Kildonan
Ph 667-0657

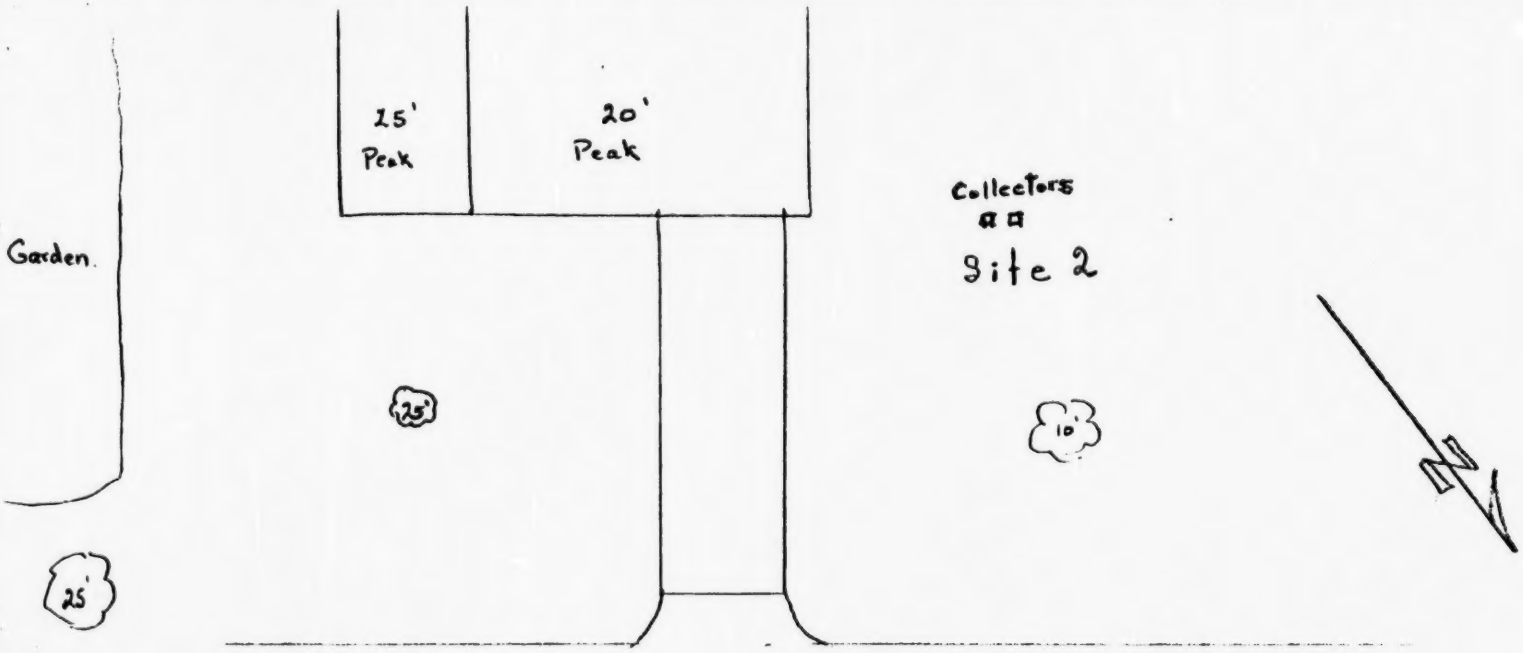


FIGURE 3
Mc Ivor Avenue (Gravelled)

Mc Callum Residence
Scale 1" = 20'
MCI 2A and 2B
830 McIvor Ave
E Kildonan
Ph 667-7990

FIGURE 4 - TOTAL SUSPENDED PARTICULATE LEVELS

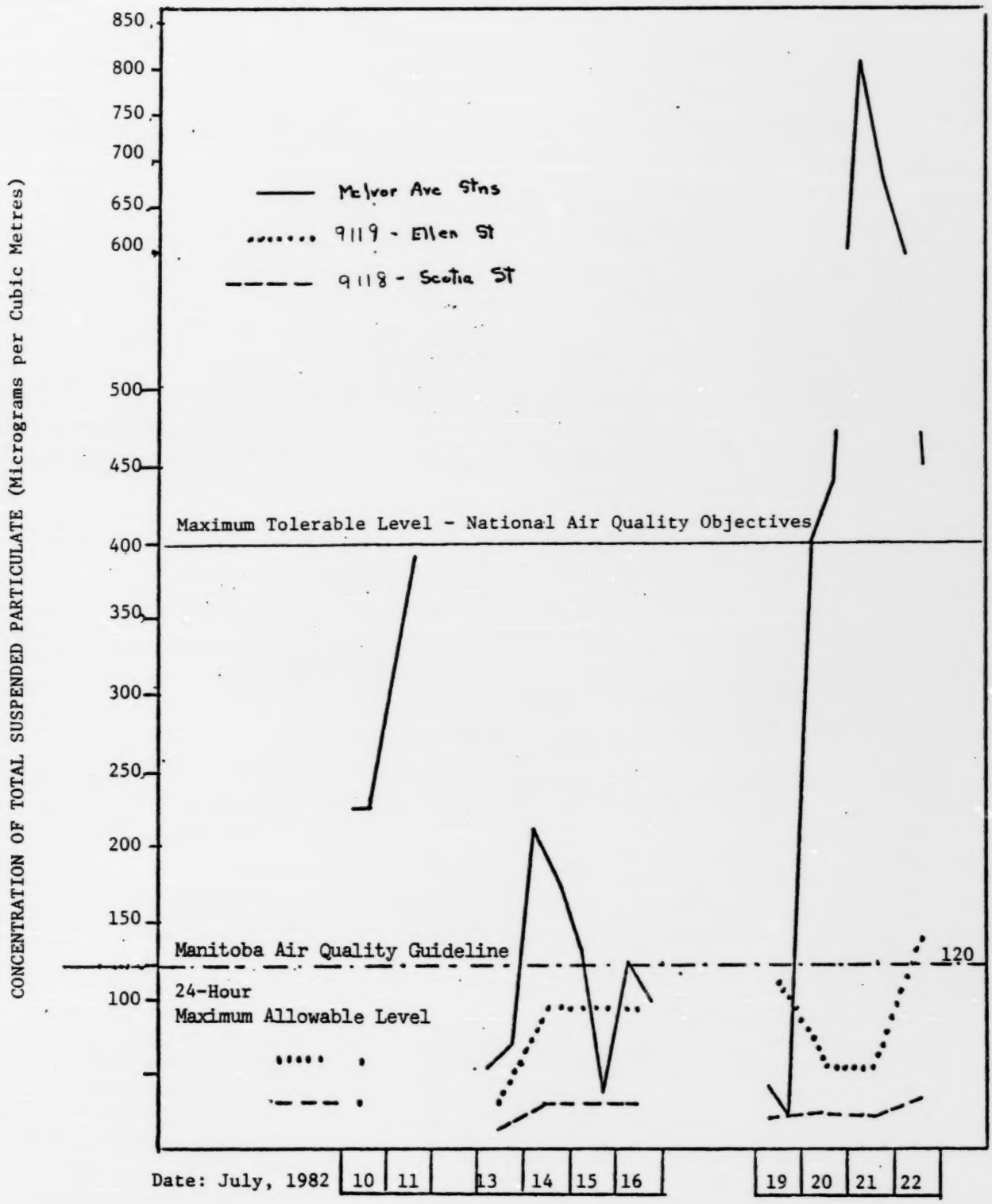


FIGURE 5 - LEAD-IN-AIR LEVELS

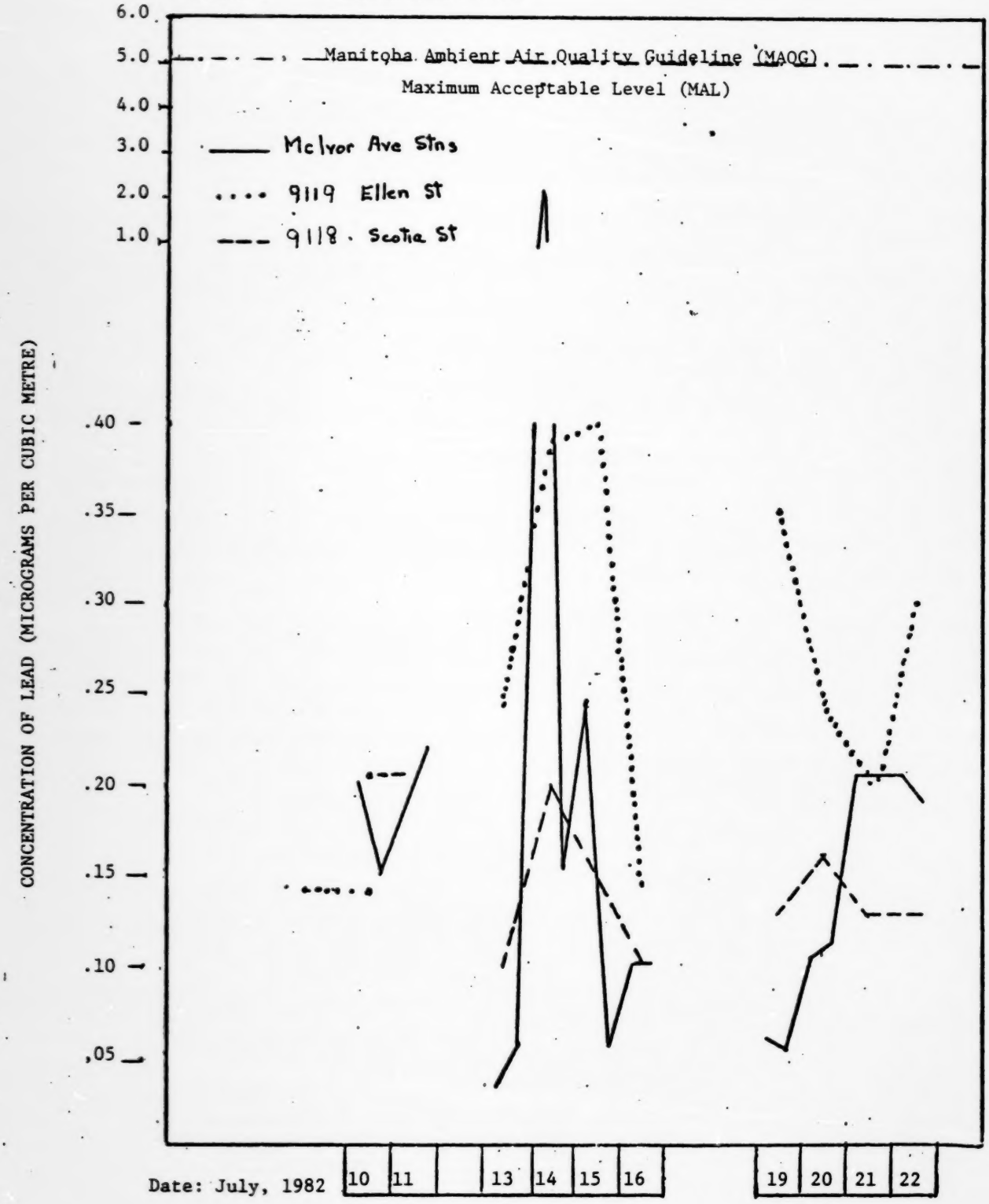


FIGURE 6 - SULPHATES-IN-AIR

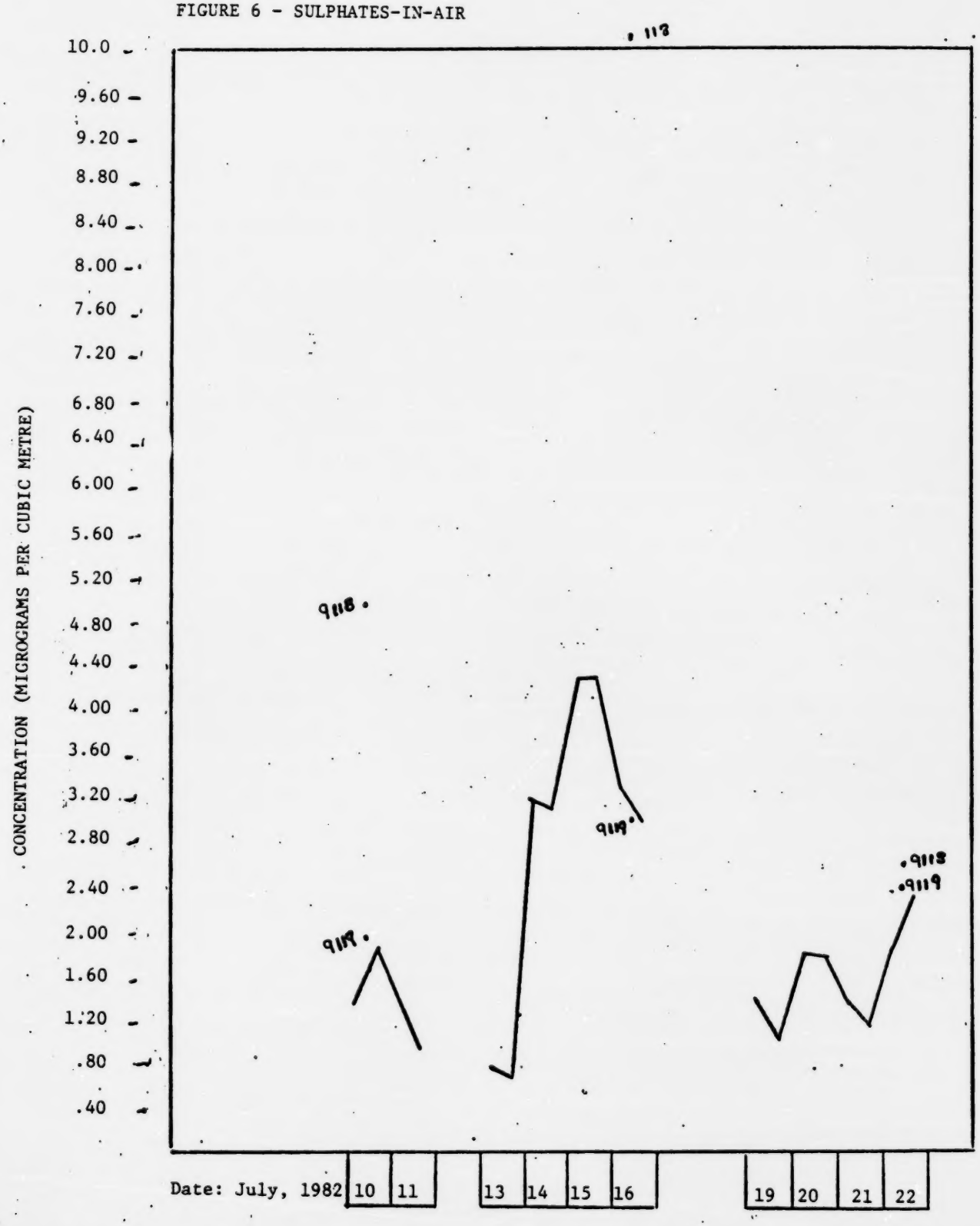


FIGURE 7 - NITRATES - IN - AIR

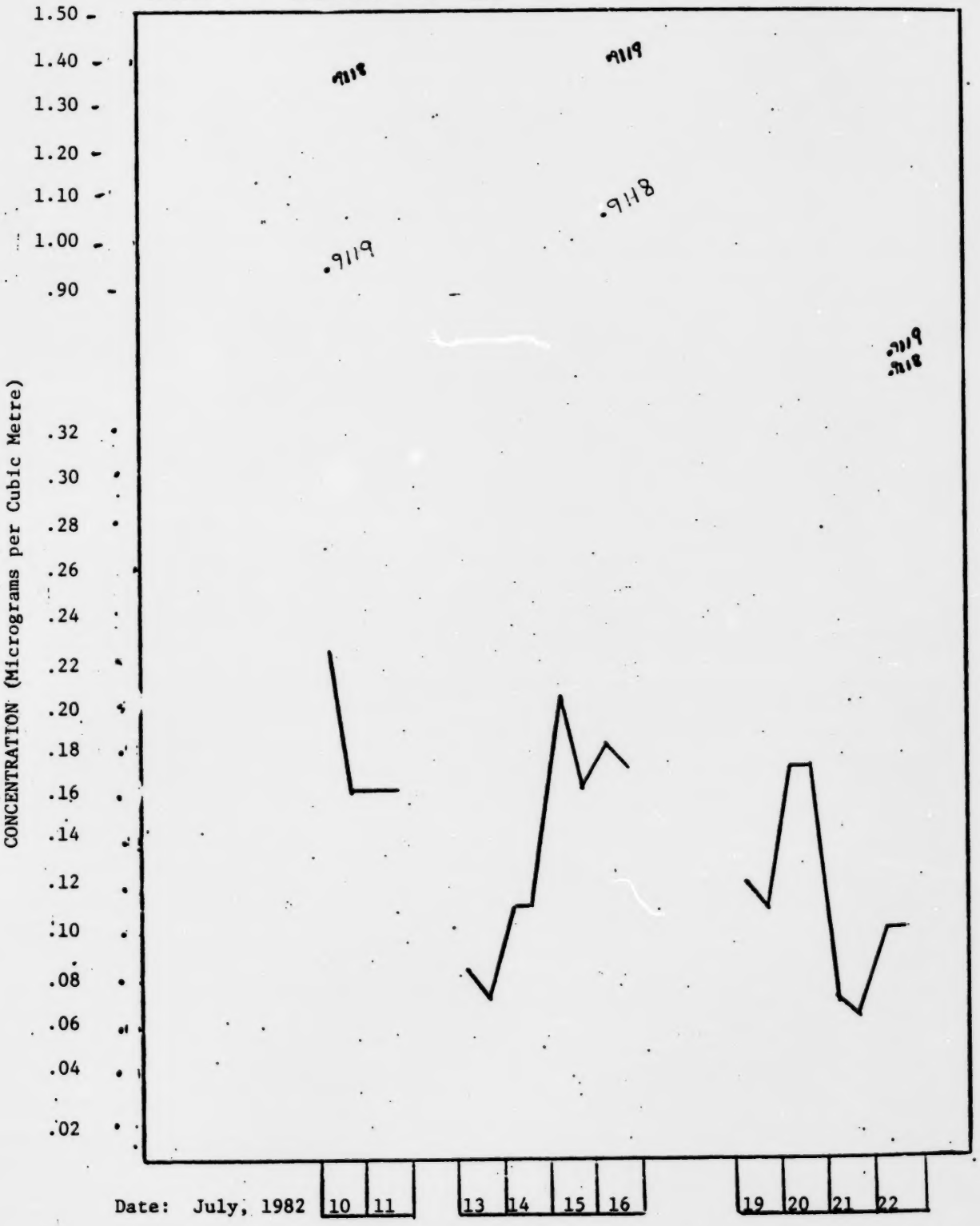


FIGURE 8 - SODIUM - IN - AIR

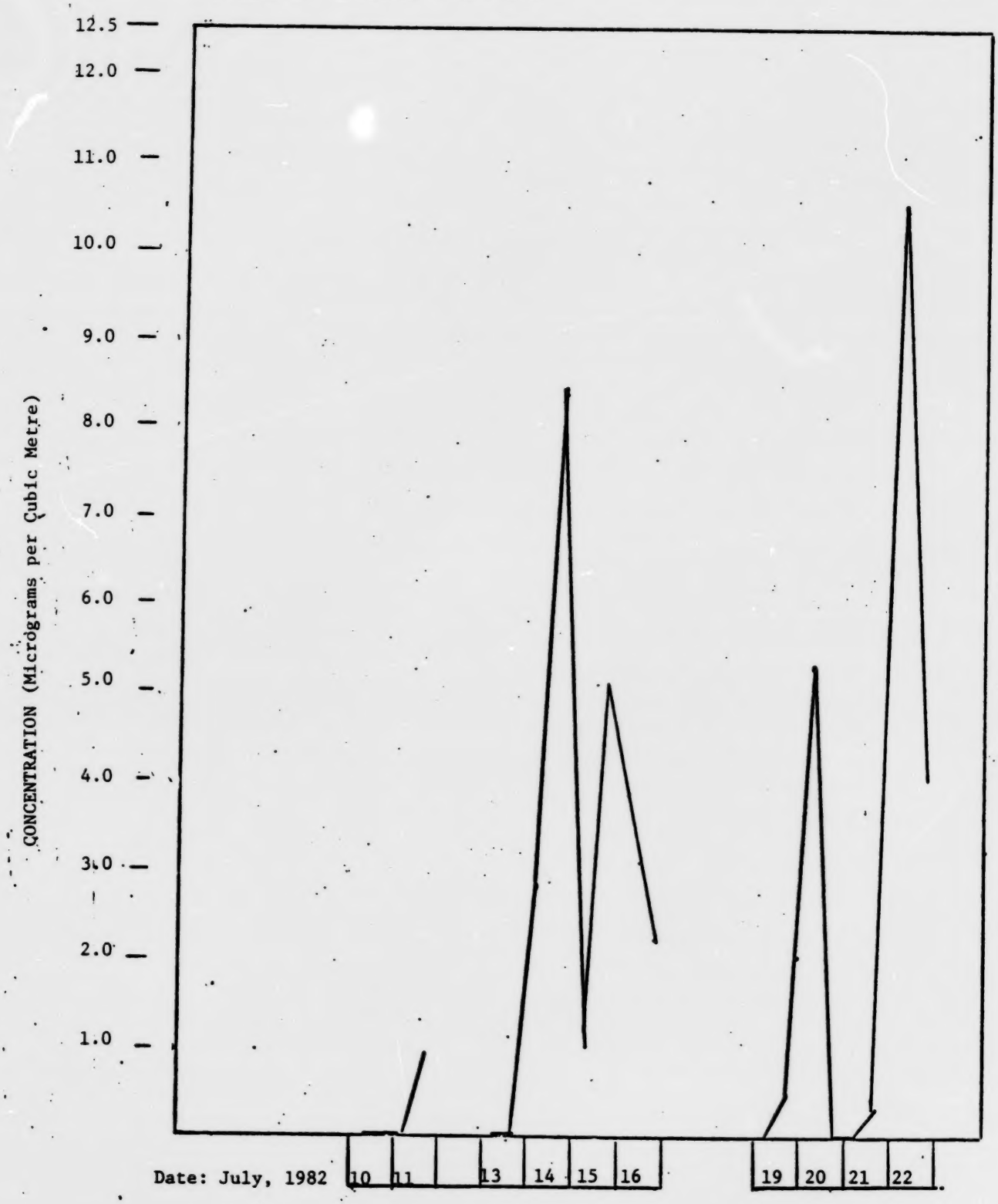
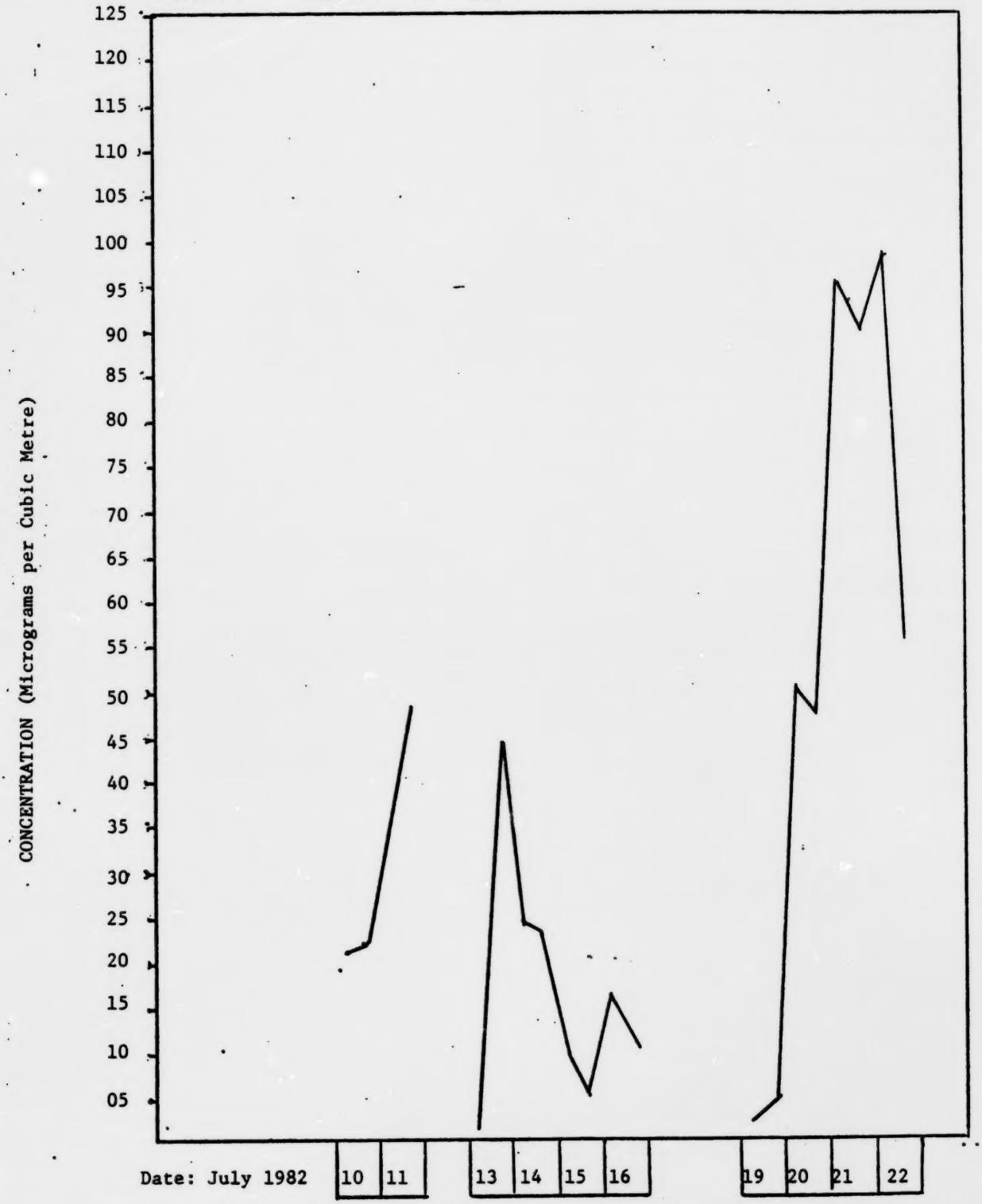


FIGURE 9 - CALCIUM - IN - AIR



January, 1982

GUIDELINES AND OBJECTIVES FOR VARIOUS AIR CONTAMINANTS

AIR STANDARDS, STUDIES AND COMPUTER SERVICES

ENVIRONMENTAL MANAGEMENT SERVICES

ENVIRONMENTAL MANAGEMENT DIVISION

PROVINCE OF MANITOBA

SCHEDULE "A"

AMBIENT AIR CRITERIA

For the air contaminants mentioned in column 1, the amount thereof in the atmosphere measured in accordance with column 2 during the period of time set out in column 3 shall not be in greater concentration in the air than the amount shown in column 4 representing the MAXIMUM ACCEPTABLE LEVEL deemed essential to provide adequate protection for soils, water, vegetation, materials, animals, visibility, personal comfort and well-being. The amount shown in column 5 represents the MAXIMUM DESIRABLE LEVEL which defines the long term goal for air quality and provides a basis for an anti-degradation policy for the unpolluted parts of Manitoba and for the continuing development of control technology.

ITEM	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
	Name of Contaminant	Measurement of Concentration	Period of Time Contaminant is Measured	MAXIMUM ACCEPTABLE LEVEL Concentration	MAXIMUM DESIRABLE LEVEL Concentration
1 Manitoba Air Quality Objective	suspended particulate matter	micrograms per cubic meter of air	24-hour average annual geometric mean	120 70	.0
Manitoba 2 Air Quality Guideline	soiling index	coefficient of haze per 1000 feet of air	24-hour average annual arithmetic mean	1.0 0.45	.45 0.3
Manitoba 3 Air Quality Guideline	dustfall in excess of normal background levels	milligrams per square centimeter (tons per square mile per month)	air basin average 30 days single point 30 days	0.8 (22.8) 1.5 (42.8)	0.6 (17.1) 1.1 (31.4)
4 Manitoba Air Quality Objective	sulphur dioxide	micrograms per cubic meter (parts per million) of air	1-hour average 24-hour average annual arithmetic mean	900 (0.34) 300 (0.11) 60 (0.02)	450 (0.17) 150 (0.06) 30 (0.01)

ITEM	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
	Name of Contaminant	Measurement of Concentration	Period of Time Contaminant is Measured	MAXIMUM ACCEPTABLE LEVEL Concentration	MAXIMUM DESIRABLE LEVEL Concentration
5 Manitoba Air Quality Objective	carbon monoxide	milligrams per cubic meter (parts per million) of air	1-hour average 8-hour average	35 (30) 15 (13)	15 (13) 6 (5)
6 Manitoba Air Quality Objective	oxidants (ozone)	micrograms per cubic meter (parts per million) of air	1-hour average 24-hour average annual arithmetic mean	160 (0.08) 50 (0.025) 30 (0.015)	100 (0.05) 30 (0.015)
7 Manitoba Air Quality Objective	nitrogen dioxide	micrograms per cubic meter (parts per million) of air	1-hour average 24-hour average annual arithmetic mean	400 (0.213) 200 (0.106) 100 (0.053)	60 (0.032)
Manitoba 8 Air Quality Guideline	hydrocarbons (non-methane)	micrograms per cubic meter (parts per million) of air	3-hour average	160 (0.24)	125 (0.19)
Manitoba 9 Air Quality Guideline	hydrogen sulphide	micrograms per cubic meter (parts per million) of air	1-hour average 24-hour average	15 (0.011) 5 (0.004)	
Manitoba 10 Air Quality Guideline	fluorides in air (as HF)	micrograms per cubic meter (parts per million) of air	24-hour average	0.85 (0.0010)	0.4 (0.0005)
Manitoba 11 Air Quality Guideline	fluorides as gas (fluoridation)	micrograms per 100 square centimeters	30 days	40	
Manitoba Air Quality 12 Guideline	sulphation	milligrams of sulphur trioxide per 100 square centimeters per day	30 days	1.0	0.5

ITEM	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
	Name of Contaminant	Measurement of Concentration	Period of Time Contaminant is Measured	MAXIMUM ACCEPTABLE LEVEL Concentration	MAXIMUM DESIRABLE LEVEL Concentration
Manitoba 13 Air Quality Guideline	lead	micrograms per cubic meter of air	24-hour average	5	
Manitoba 14 Air Quality Guideline	beryllium	micrograms per cubic meter of air	24-hour average	0.01	
Manitoba 15 Air Quality Guideline	odours	odour units	two tests not less than 15 minutes apart nor more than 60 minutes apart	Residential Zone one volume of odourous air diluted with one volume of odour free air (2) Industrial Zone one volume of odourous air diluted with six volumes of odour free air (7)	less than the odour threshold

NOTE: Odours: Item 15

The release of offensive odours past the property line of any source shall be eliminated, or minimized, such that the said odours will not interfere with the comfort, well-being or enjoyment of any person. In most situations, achieving the Maximum Aceptable Level, will satisfy this condition.

January, 1982

GUIDELINES FOR VARIOUS AIR POLLUTANTS

AIR POLLUTION CONTROL SECTION

ENVIRONMENTAL CONTROL SERVICES

ENVIRONMENTAL MANAGEMENT DIVISION

PROVINCE OF MANITOBA

SCHEDULE "C"

ATMOSPHERIC EMISSION CRITERIA

1. Application

a) In this Schedule, it is recommended that:

i) all existing operations be required to meet the limits for visible emissions, products of combustion and particulate matter as specified in Sections 3(a), 3(b) and 3(c).

ii) all new or proposed operations be required to meet the limits for visible emissions, products of combustion and particulate matter as specified in Sections 4(a), 4(b) and 4(c).

b) It is recognized that certain operations, because of their location and/or type of contaminants being released to the atmosphere, may require more stringent limits than those specified in the base guidelines below. These operations will be assessed on their own merit and suitable limits specified.

c) The Federal Department of Fisheries and the Environment is developing National Emission Guidelines and National Emission Standard Regulations for the control of air pollutants from specific industry sectors. As these Guidelines and Standard Regulations are promulgated, they will be applied in Manitoba as maximum baseline standards for new or proposed industries immediately and for existing industries on a negotiated time frame.

d) The limits in this schedule are intended to be applied as stack emission limits.

2. Definitions

a) "Opacity" means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.

b) "particulate matter" means any finely divided liquid or solid matter other than water droplets.

c) "products of combustion" means particulate matter discharged into the atmosphere from the burning of any kind of material containing carbon in the free or combined state.

d) "odours" means a gaseous, liquid or solid material that elicits a physiological response by the human olfactory sense.

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3. Limits for Existing Operations

a) Visible Emissions shall not exceed
   i) an opacity which is equal to or greater than 60% at any time;

   ii) an opacity which is equal to or greater than 40% for a period exceeding four minutes in any one hour.

b) Products of Combustion from any combustion source shall not exceed 0.57 grams per standard cubic meter calculated at 25° Celsius and 760 millimiters of mercury (0.25 grains per standard cubic foot calculated at 77° Fahrenheit and 29.92 inches of mercury) corrected to 12% carbon dioxide.

c) Particulate Matter from any source shall not exceed 0.57 grams per standard cubic meter calculated at 25° Celsius and 760 millimeters of mercury (0.25 grains per standard cubic foot calculated at 77° Fahrenheit and 29.92 inches of mercury).

4. Limits for New/Proposed Operations

a) Visible Emissions shall not exceed
   i) an opacity which is equal to or greater than 40% at any time;

   ii) an opacity which is equal to or greater than 20% for a period exceeding four minutes in any one hour.

b) Products of Combustion from any combustion source shall not exceed 0.23 grams per standard cubic meter calculated at 25° Celsius and 760 millimeters of mercury (0.10 grains per standard cubic foot calculated at 77° Fahrenheit and 29.92 inches of mercury) corrected to 12% carbon dioxide.

c) Particulate Matter from any source shall not exceed 0.23 grams per standard cubic meter calculated at 25° Celsius and 760 millimeters of mercury (0.10 grains per standard cubic foot calculated at 77° Fahrenheit and 29.92 inches of mercury).

5. Odours shall not exceed 150 odour units at the point of emission.

Jan. 30/80
V-17-3

MANITOBA AIR QUALITY OBJECTIVES
Prepared by the
DEPARTMENT OF CONSUMER AND CORPORATE AFFAIRS AND ENVIRONMENT

AIR POLLUTANT	MAXIMUM TOLERABLE LEVELS	MAXIMUM ACCEPTABLE LEVELS	MAXIMUM DESIRABLE LEVELS
Sulphur Dioxide	- 300 to 800 micrograms per cubic meter average concentration over a continuous 24 hour period	- 60 micrograms per cubic meter (0.02 ppm) annual arithmetic mean - 300 micrograms per cubic meter (0.11 ppm) average concentration over a 24 hour period - 900 micrograms per cubic meter (0.34 ppm) average concentration over a one hour period	- 30 micrograms per cubic meter (0.01 ppm) annual arithmetic mean - 150 micrograms per cubic meter (0.06 ppm) average concentration over a 24 hour period - 450 micrograms per cubic meter (0.17 ppm) average concentration over a one hour period
Suspended Particulate Matter	- 120 to 400 micrograms per cubic meter average concentration over a continuous 24 hour period	- 70 micrograms per cubic meter annual geometric mean - 120 micrograms per cubic meter average concentration over a 24 hour period	- 60 micrograms per cubic meter annual geometric mean
Carbon Monoxide	- 15 to 20 milligrams per cubic meter average concentration over a continuous eight hour period	- 15 milligrams per cubic meter (13 ppm) average concentration over an eight hour period - 35 milligrams per cubic meter (30 ppm) average concentration over a one hour period	- 6 milligrams per cubic meter (5 ppm) average concentration over an eight hour period - 15 milligrams per cubic meter (13 ppm) average concentration over a one hour period
Oxidants (Ozone)	- 160 to 300 micrograms per cubic meter average concentration over a continuous one hour period	- 30 micrograms per cubic meter (0.015 ppm) annual arithmetic mean - 50 micrograms per cubic meter (0.025 ppm) average concentration over a 24 hour period - 160 micrograms per cubic meter (0.08 ppm) average concentration over a one hour period	- 30 micrograms per cubic meter (0.015 ppm) average concentration over a 24 hour period - 100 micrograms per cubic meter (0.05 ppm) average concentration over a one hour period
Nitrogen Dioxide	- 400 to 1000 micrograms per cubic meter average concentration over a continuous one hour period	- 100 micrograms per cubic meter (0.053 ppm) annual arithmetic mean - 200 micrograms per cubic meter (0.106 ppm) average concentration over a 24 hour period - 400 micrograms per cubic meter (0.213 ppm) average concentration over a one hour period	- 60 micrograms per cubic meter (0.032 ppm) annual arithmetic mean

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